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Final Report
Opportunities for Technology Transfer in Communications in New Brunswick

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1 Introduction

1.1 Background

The federal Department of Communications (DOC) is seeking opportunities to transfer technology developed at the Department's research facilities. In particular, the work being carried out at the Communications Research Centre (CRC) and the Canadian Workplace Automation Research Centre (CWARC) is targeted for transfer to the private sector and to government agencies and departments.

There are several approaches which have been used by DOC, including:

- Development of application centres which focus on a particular area of communication technology (examples include the Canadian Centre for Marine Communications in St. John's and the Telematics and Health Care Centre in Winnipeg);

- Projects of a one-time nature, using technology to solve a particular communication problem to improve the operational efficiency of a government department or agency; and

- Projects with economic development spinoffs through private sector involvement.

The Province of New Brunswick is also interested in opportunities for increasing its base of technology-related business and developing advanced technological applications. As well, technology transfer is a key component of the Canada/New Brunswick Industrial Innovation and Technology Development Agreement.

There have been several collaborative efforts between New Brunswick and DOC to sponsor communications technology activities. Notably among these examples are the Champlain Institute (to foster and encourage the development of geomatics in the Atlantic region), the Centre for Research and Development in Automated Translation at the Université de Moncton, and collaborative efforts with the Departments of Health and Community Services, Advanced Education and Training, and Education in the field of distance education.

This study of opportunities for technology transfer from DOC to provincial government departments was undertaken in response to the interests of both DOC and the Province of New Brunswick.

1.2 Study Organization and Scope

Management of the study was carried out by a Steering Committee of DOC and provincial government representatives, with funding provided by the Canada/New Brunswick Subsidiary Agreement on Planning. The economic sectors included in the study were determined by the Steering Committee and included the following eight areas:

- Fisheries
- Mining
- Justice
- Environment
- Forestry
- Transportation
- Municipal Affairs
- Information Systems

An additional area, Health Services, was added after the project began.

1.3 Methodology

The methodology was as summarized below:

- Visits to CRC and CWARC to review the work being carried out in these centres and to discuss technology transfer with DOC staff. Appendix A is a list of the various individuals consulted during the course of the study.

- Conducting structured group interviews with representatives from all of the sectors cited above to identify needs. In most sessions, similar types of applications were identified by more than one respondent and these were combined as much as possible to develop potential applications. As a result of this process, 41 different ideas and/or projects emerged for review. A list of all those who attended workshops is included in Appendix B.

- A "short listing" of the key ideas and themes which emerged from the group interviews assembled by the consultants for review with the Steering Committee.

- A second round of meetings at CRC, the Atlantic regional office of DOC and private sector firms to discuss each of the short listed ideas in greater detail. Ultimately, some ideas were dropped, while others were refined or extended based on this additional review.

- Selection of the highest potential technology transfer candidates and development of a strategy for advancing the use of each.

1.4 Organization of the Report

This first chapter constitutes the **Introduction** to the study.

Chapter Two, **Communications Technology Needs - The Users' Perceptions**, discusses the general findings of the research conducted with users and departmental representatives and discusses areas which users identified as being high priority for them.

Chapters Three, Four, Five and Six discuss the **major technology transfer projects** resulting from the study, which are, respectively:

- Chapter 3: Emphasis on Personal Communication
- Chapter 4: Image Compression, Storage and Retrieval
- Chapter 5: Remote Data Collection/Sensor Platforms
- Chapter 6: MDS Trial Opportunity.

Chapter 7 provides a **Conclusion**, summarizing the main findings and observations from the study.

Chapter 8 provides the recommendations arising out of this study.

2 Communications Technology Needs - Users' Perspectives

2.1 The Province's Main Communications Issues Are Not Technology Issues, But Resource Issues.

In the process of interviewing staff of the various government departments involved with the technology areas identified for the study, a message became very clear. The most pressing, high priority communication needs of virtually all departments in the provincial government have little to do with new technology. Individuals' concerns are primarily with having good information about technology, being able to send and retrieve information, and having more capability to communicate interactively more frequently. Although we have identified a number of potential applications for joint initiatives with the two levels of government, the priority for these was relatively low as compared to some of the more basic problems.

An example of the type of problem which concerns most managers is the lack of an ability to retrieve and manipulate data from different data bases, often in different locations. Users indicated a high level of need for more equipment and software and the construction of databases which enable improved decision-making. However, it was readily acknowledged that the problems do not require any new or unique communications technology; rather, the problem is insufficient resources -- not enough budget or limited time available to get the problems solved.

It was evident from our discussions that if resources are to be invested in improving communications through technology, the areas which should receive the lion's share of the attention are those involving relatively straightforward technology solutions.

2.2 Communications Challenges and Opportunities for New Brunswick's Public Sector

Based on the group meetings as well as interviews with other key individuals with experience in the field of communications technology, we identified nine key "themes":

1. Communications, Education and Economic Development. Several people we interviewed had a vision of communications as a means for New Brunswick to make a significant "technology leap forward". The example was cited of the experience in France with placement of computer terminals connected to the telephone in every household. France used this strategy to familiarize its citizens with computer technology, to communicate useful information, and to provide teaching and networking opportunities. It also provided business opportunities for electronics manufacturers in the country and for software applications developers who found ways to provide services which could be used in the network. Given New Brunswick's commitment to improving the educational system and increasing access to jobs requiring technical literacy, providing residents with in-home computers could help to achieve this goal quickly, possibly with a higher return than investments in the formal education system.

2. Multi-jurisdictional voice communications. Many examples were given of problems in trying to communicate by radio with different jurisdictions. Among these were:

- Inability of local police forces to communicate with the RCMP
- The lack of ability to communicate across the US border during emergencies (e.g. communication between the fire departments in St. Stephen and Calais.)
- Regulations which prohibit providing radios linked to the IRCS network to other than provincial government users.

Individual municipalities buy radios for their police and fire services, but there is no consideration at the time of purchase to ensure that they can be used to communicate with other services in the event of an emergency.

Many users pointed to the frustration of trying to coordinate activities via radio. There is a clearly defined need for leadership in resolving the technical, regulatory and political issues which constitute the barriers to interoperability and to provide advice and direction to users. We believe that there is an opportunity to establish an organization of federal and provincial communications experts in New Brunswick to attempt to resolve these issues. The need tends to be more on the regulatory dimension than the technical, and thus this concept is outside the terms of reference for this study. However, it is an opportunity which merits further exploration.

3. Remote Data Collection and Transmission. Several departments need to have the ability to transmit data from remote sites to a central point. Examples given included:

- Sending data from remotely located weather monitoring stations for forest fire monitoring and prediction. These sites are usually located in the forest remote from any source of power or transmission lines

- Collecting and sending weather and road condition data from the roadside to the office of the highways department.

This is an area which has attracted some interest from DOC as it involves communications platforms and the potential for use of satellite communications. It is also an area where there is an opportunity for New Brunswick electronics firms to become involved in the design and manufacture of components of the remote sensing and communications devices.

4. Communications Technology Advisory Service. Numerous individuals alluded to a need for a communications technology advisory service. This service is needed to provide information on the types of equipment to purchase and protocols for intercommunicating as well as carrying out needs assessments for various types of communications hardware and software. Some saw this service extending to the private sector as a means of providing small business with information about communications to help them operate more efficiently.

This is an area of need in the province; however, whether or not a special thrust is required would require more study. It is unlikely that DOC would do much more than is already being done in the regional office.

5. Office Automation. The most frequently-mentioned area of communication technology need was basic office automation. This covered the range from more fax machines to networking of offices in order to exchange data more efficiently. The envisioned solutions did not for the most part require any new technology; what is needed is more resources to purchase the necessary tools. Because there does not appear to be any real need for new technology, this does not qualify as a candidate for joint federal-provincial technology transfer activity. However, managers view this as a very high priority need, critical to efficient operations.

6. Artificial Intelligence. Some suggestions were made about the possible use of AI in problem solving. Although none of the particular suggestions proved to represent potential projects for DOC, we believe that more focused searching of other informants or departments could turn up promising applications. For example, DOC has done some work on evaluation of projects for funding under federal provincial ERDA agreements. Possibly, similar algorithms would also apply to agreements in New Brunswick. As this was outside the scope of our study, we have not followed up with the departments involved; however, such a follow-up by the Commerce and

Technology representative on the steering committee could provide useful insight into the transfer potential of the idea.

7. Teleconferencing. It is fair to say that almost every department was interested in some form of teleconferencing between offices. The technology was mainly seen as a way to reduce travel time to meetings or to increase the frequency of meetings. In one case, teleconferencing was also seen as a way for individuals to interact with support groups or other individuals with similar problems. Almost everyone felt that the equipment should be brought to them; the idea of teleconferencing centres located around the province was not felt to be practical.

8. Image Communication. Increasingly, government departments need to be able to move and store visual images. For example:

- In the Solicitor General's department, scalehouse operators must make decisions about whether or not to accept a truck which is not loaded according to regulations. If the operator could send an image of the truck to a supervisor, then a better decision could be taken.

- The Department of Transportation would like to be able to monitor its building on closed circuit cameras to check for theft or vandalism.

- The Assessment Branch of the Geographic Information Corporation would like to store a video image of the properties as they are assessed and to retrieve the information for the regular annual assessment of the property.

- The Department of Health and Community Services suggested that the ability to transmit X-rays electronically would enable smaller hospitals to provide improved diagnostic capabilities to their patients.

Departments are seeking technology solutions for this type of problem. In some cases, the solutions do not require new technology; acquiring existing technology would solve the problem. However, there is a need for good information about services and products which are available. At this point, it is unclear whether the newly-formed Centre for Image and Sound Research at Simon Fraser University will be able to deal with these types of projects. However, its planned research activities, as described in a January press release, appear to offer the potential to cover the above projects:

> "Research and development activities will include image processing, computer graphics, computer vision and pattern recognition, 3-D animation, computer-based 3-D modelling techniques..."

More information is needed about the types of projects and research priorities of the Centre. Proponents of the above projects and the regional representatives of DOC should discuss the New Brunswick needs with officials from the Centre to see if there is any potential for collaboration.

9. Empowerment of the Individual through Communications. There were examples from several group sessions of a desire for departments to be able to offer individuals better access to services and information from government databases. Some of the examples included:

- Community-based "instant teller"-type machines to enable residents to update drivers' licences, pay property taxes or request information about government programs.
- Province-wide 911 emergency service
- Using home-based communications to enable individuals to access self-help or support groups

- Access to information concerning mining claims, rights and exploration history.

The issues and examples, for the most part, do not need any significant amount of new technology. The solutions do need new communications infrastructure and major changes to existing databases; nevertheless, the area was seen as one where communications could improve service delivery in a province with a relatively geographically dispersed population.

2.3 Stand Alone Applications

In addition to the major themes, several stand-alone applications also emerged from the group interviews. Some of the ideas have already been pursued and applications are being developed. Among the suggestions were:

- Use of videotext technology to compile the Department of Supply and Services' Computer Buyers' guide

- Development of a compact portable locator system for prospectors and other workers in remote areas

- Temporary mobile systems for emergencies in "blank spots" outside the reach of the IRCS network, or to use if there is a failure in one of the repeater stations

- Prisoner transit/tracking system to enable law enforcement officers to track prisoners who escape while in transit, possibly also combining some temporary disabling device

- System for tracking and logging time of operations of heavy equipment used by the Department of Transportation

- Finding a better solution to transmission of vital signs from ambulances

- Seconding Supply and Services staff to CWARC to become more familiar with OSI capabilities and standards.

2.4 Selecting Practical Projects

The above list of themes and stand-alone projects describes most of the needs which were identified. For the reasons outlined, several of them are not necessarily candidates for DOC/New Brunswick technology transfer projects. However, through a process of elimination, the field of good potential opportunities has been narrowed down to a "short list". Each of the short listed ideas is expanded more fully in the following chapters.

2.5 Communications Implementation Committee

The variety and scope of opportunities is quite broad. Some of these opportunities require an on-going push to see them furthered. To properly address the overall approach and implementation of these opportunities requires the establishment of a committee tasked with the responsibility of managing the implementation process. This committee or Communications Advisory Team is necessary to ensure the advancement of this study's findings and to see that communications issues and opportunities are addressed.

3 Personal Communications

Personal communications will receive increasing attention during the next decade. Personal communication is a rather broad and diffuse area encompassing everything from the telephone and its modern counterparts (cellular and mobile communication) to community-based services such as bank teller machines.

3.1 The Rationale for an Emphasis on Personal Communication

The importance of personal communications is reinforced by the recently announced Vision 2000 initiative and the investments which will be needed to implement the program. Vision 2000 is a joint private and public sector initiative to examine the role of personal communications and the technologies needed to support the advancement of personal communications in the next century.

Current issues such as literacy and the general education level of New Brunswick's residents can be addressed and improved through the use and application of personal communication. With a concerted effort to apply personal communication technology, it may be possible to create a more technologically aware and sophisticated population, in a much reduced time frame. The benefit to the province would be evident in terms of increased economic activity and an influx of companies who require a technologically advanced workforce.

Advancement will require better information, experimentation and piloting of personal communications technologies and applications. An opportunity also exists to position New Brunswick as a "test bed" for personal communications applications related to government programs, services and information in a wide variety of sectors.

Over the course of the study many references have been made that relate to the broadly defined area of personal communications. The general lack of awareness of communication and information technologies and the application of these technologies is one indication of the need.

Another indication is the need for better and broader access to information and data, both from individual clients of government programs as well as from staff.

Many examples were given of needs pertaining to the empowerment of the individual, both in terms of social and health programs, as well as for dealing with government in other ways.

The common theme is making communication technology available to the individual, whether that individual is a government employee, a program client or a resident seeking information or assistance from government.

The mission of Vision 2000 is to develop an overall framework for personal communication and to make the medium invisible to the user. This thrust can build upon the efforts of Vision 2000 to develop alternative applications for existing and emerging technologies.

3.2 Objectives for Personal Communications

The primary focus of effort is to improve the overall capability of the New Brunswick work force. A high capacity communications network offers a solution to eliminating the shortcomings of New Brunswick's present education system. A concerted effort can accelerate New Brunswick's technological competence more rapidly than other regions. In the long term, this will mean a more highly educated and technologically sophisticated population which will be better able to meet the needs of employers. This will give New Brunswick a competitive advantage for economic development and attracting new companies.

While the primary thrust is to improve education levels and enhance economic development there are some more immediate benefits to be gained. Specifically, these benefits are cost savings resulting from a more efficient delivery of government services and improved operations within departments. Economic benefits should be realized at this stage, as well, resulting from the development and commercialization of interfaces and applications. The commercialization should expand beyond New Brunswick as other regions adopt the ISDN technology.

In summary, the objectives of an emphasis on personal communications are threefold: first and foremost, to enhance the level of education and technological sophistication of New Brunswick's population, secondly, to increase economic development by meeting the needs of employers and by building an industry around ISDN applications; and thirdly, to reduce the cost of providing government services by utilizing more efficient technologies.

3.3 The Concept

The basic concept would be; first, to put in place an ISDN communications platform in government, business and private households in the province (this could involve pilot sites or the entire province).

This ISDN platform would provide a communications infrastructure that is "state of the art". It would represent one of the largest (if not the largest) application of ISDN technology. Once in place, this infrastructure would provide a high capacity network able to exchange large amounts of voice, graphic, textual and other data.

The second part of the concept is to promote the utilization of the network and to foster and select projects and applications. The network should attract projects from both the private and public sector with a wide array of applications - ranging from videotext for home shopping and news, to links into educational programs and computer aided training.

There are a number of technologies which need to be emphasized and for which a focus should be developed. ISDN represents the most significant single technology; however, others must be considered either as stand-alone technologies or paired with ISDN. These technologies include: teleconferencing, computer aided video training, videotext and teletex; home management and personal monitoring systems, as well as smartcard and other technologies.

3.4 Step 1 - Build the ISD Network

As noted in the previous section, an emphasis on personal communication is a two-step process. This section discusses the first step, building the network.

The ISD network is the backbone of the whole emphasis on personal communications. It provides the means to developing applications. ISDN is the critical building block needed to address personal communications issues.

Building a province-wide ISDN is not a small undertaking, it requires the upgrading of the telephone system including such equipment as switching stations, phone lines and, in particular, phone handsets. The investment is considerable and to justify the investment, requires a particular level of committee usage. According to NBTel, commitments to use the network by the province, federal agencies (located in the province) and by NBTel themselves may be sufficient to justify the construction of the network. The justification for the province to commit to using the network is twofold: firstly, the network can provide improved efficiencies of operation through increased rates of transfer of data and broader access; secondly, are the direct and indirect economic benefits which will accrue: development and commercialization of applications; and a better educated and more technologically sophisticated population.

The benefits of Phase 1 are limited to the enhanced efficiency of providing services.

Phase 2 is where most of the benefits lie. However, obtaining these benefits is not possible without the infrastructure-building step in Phase 1.

3.5 Step 2 - Developing Applications

Once the infrastructure is in place, applications which utilize the ISDN technology can be developed. These applications will vary according to the purpose and the audience. Private companies and public sector agencies will develop applications for internal use as well as those to sell or provide services to clients. Applications will also be developed to provide new services which do not yet exist. For example, the Department of Advanced Education and Training may provide courses in-home to upgrade skills; the Department of Health and Community Services may utilize the network in conjunction with computer aided training to educate seniors about prescription drugs and poly pharmacy, or new parents about child care.

In addition to applications of ISDN technology, other personal application technologies will see the development of applications.

Examples from our research include:

- Experimenting with Smartcard technology for government/client services such as drivers' licenses, driving records and patient health records.

- Application of automated banking machine technology to be used to allow self-service for such tasks as renewing licenses or updating vehicle registration;

- Alex technology presently being utilized on a trial basis in Montreal could be used for in-home shopping, banking, as well as access to other public and private sector goods and services;

- Projects related to the use of teleconferencing to provide counselling, group therapy and group support services;

- Projects related to enhancing an individual's independence in the home through the application of technologies such as home management systems.

personal monitoring devices, a province-wide enhanced 911 system, and Nightstar and equivalent products for the handicapped;

The above noted projects represent a partial list of the projects to be conducted. Further in-depth study is needed to identify a comprehensive list and to allow for the setting of priorities.

Additionally, the province can enhance the development of related industries such as geomatics. Geographic Information Systems require large amounts of data. An ISDN would allow for the efficient transfer of this data and could,therefore, provide a significant boost to New Brunswick's geomatics industry.

3.6 Federal, Provincial and Private Sector Involvement

To fully develop an emphasis on personal communication will require the support of both the provincial and federal governments, as well as private sector partners. All projects will have a sponsor (government department, agency or private sector partner) from the time of project inception.

It will also be essential that, where applicable, field staff who have the knowledge and expertise in the particular application area be included to monitor and advise on implementation.

Technical assistance on a project-by-project basis will be the primary DOC involvement. Specific projects such as interactive computer aided video training will likely require an on-going relationship and the provision of researchers to work on the project. Financial and human resource assistance may also be available through Vision 2000.

The main private sector participant is envisioned to be NBTel, who would need to install the ISD network. To justify the substantial investment required for the ISDN infrastructure, NBTel will need some commitments for usage of the network. The two

levels of government will therefore probably need to subscribe to a minimum level of service. The extent of the commitment would need to be discussed with NBTel.

In addition to NBTel, it is conceivable that other private sector companies will be active in the ISDN project. These companies will be responsible for the development of applications for the network for use in the public sector. The participation of these companies is critical because the resources of NBTel would not likely be sufficient to undertake expeditious application development.

3.7 Sources of Funding for Personal Communications Applications

Funding of the efforts related to personal communication may be available from several sources:

- Use of the Industrial Innovation and Technology Development Agreement (IITD) to fund specific projects;
- Individual provincial departments such as Health and Community Services would finance some experiments either on a user-pay or cost-shared basis;
- ACOA may be able to provide funds for specific projects;
- The Department of Veterans' Affairs through its Veterans' Independence Program may also be a source of funding, for projects that relate to the independence of seniors. VIP's mission is to assist veterans to live the most independent lives possible in their own homes;
- The Department of Communications, could assist financially through sponsorship of projects;
- Private sector participants, in addition to sponsoring project funding will be able to provide copies of their products, researchers and perhaps some of the

equipment that will be necessary to carry out the projects. NBTel will need to commit its own resources to the development and building of an integrated services digital network. It will also have to commit to utilize the service for its own operations, in order to justify the development;

3.8 Implementation Activities

Timing is critical. Vision 2000 will, we believe, heighten the awareness of personal communications opportunities. To be effective, the province will need to take an aggressive position if it is to share in the benefits related to these technologies. This is particularly the case for ISDN. If the province is hesitant and accepts a "wait and see" posture, then the benefits will accrue to another region of the country or the world. If the posture is more aggressive then the province could realistically place itself at the leading edge as it relates to ISDN. This may very well be the edge necessary to position the province as a leader in the application of information and communications technology.

Discussions with NBTel must commence immediately to ascertain what is needed and the extent of commitment required from the provincial and federal governments. The case for involvement will have to be well developed and the conceptual design formulated.

While all indications are that the Centre is a needed and useful initiative, further assessment of its feasibility is required before it is possible to determine the extent and form of the application centre. The initial indications are that the activities should include developing applications for existing technology and should not be involved in the development of products. The mission and role would be defined during the feasibility study, as well as issues like the research priorities, and the

relationship to other organizations and private sector participants. Components to be included in a more detailed examination of the concept include:

Feasibility

- Detailed assessment of the needs related to personal communication
- Comprehensive cataloguing of suppliers' personal communication devices
- Estimation of operating costs
- Assessment of suppliers' willingness to take part in and fund research and application development
- Assessment of the market opportunities.

Business Plan

- Definition of the scope of personal communication involvement
- Establishment of broad goals or guiding principles
- Definition of the role and mission
- Development of marketing plan
- Development of organization plan
- Development of financial plan
- Development of implementation plan.

An emphasis on personal communications is a major undertaking the communications advisory team which was previously recommended will need to play a lead role in championing the concept. Their involvement must commence immediately by undertaking formative discussions with NBTel, commissioning an initial feasibility and concept refinement study and by setting the wheels in motion to prepare for fast action once the results area available.

To be gained from all these efforts are a more highly educated and technologically sophisticated population and enhanced economic development.

4 Image Compression, Storage and Retrieval Projects

There are two projects which were identified that relate to this project area. These projects are videologs of the province's roads and visual images of properties registered for assessment purposes. Both of these projects have a strong geomatics affiliation which must be recognized since Geomatics is an industry which is targeted for significant involvement.

4.1 The Need for Image Compression, Storage and Retrieval Projects

Our discussions over the course of the study have revealed an interest in storing and retrieving videotape-based images from large visual databases. These projects offer the departments of Transportation and the Assessment Branch more efficient and better ways to examine physical features as an alternative to field visits.

4.2 Enabling Technologies

Advanced technologies are available that enable random access to visual images. These technologies allow for the storage and retrieval of visual images either video tape or photographs. Existing optical disk technology and newly emerging digital cameras enable the storage of visual images. The major difficulty is with the compression of image data and the retrieval process. DOC staff are interested in this field and in the possibility of joint projects with the province.

4.3 Projects Needed

Department of Transportation. This project involves storing videotape records of all the highways in the province. Currently, the Department videotapes the highways of the province to enable determination of road repair requirements without the need for a site visit by the engineers or technicians. The problem the department is faced with is how to access quickly the videotape record for a particular stretch of road.

Property Assessment Branch. This project was not identified during group discussions, but arises from previous discussions with the Assessment Branch. This project involves the storage of visual images, in the form of videotape or photographs, of all the properties in New Brunswick. The visual images would be used to simplify the process of property assessment and review in the case of an appeal. Secondary uses for the visual image data base could also be developed; for example, they might be made accessible to insurance companies or real estate agents.

As noted in a previous section, these two projects have a strong link to Geomatics. In fact, the Geomatics industry has a great deal to offer these projects and a great deal to benefit from them. The expertise developed around image compression storage and retrieval is extremely useful for Geomatics. A geographic information system requires the storage of vast amounts of data, this technology will make the storage of that data much more efficient.

Both projects result in the coupling of GIS technology and techniques with visual image storage and optical disk technology. The combination of these technologies enhances New Brunswick's Geomatics capability and introduces a service which is potentially exportable.

4.4 Economic Development Impact

The direct benefits of these projects will be the employment created for logging, indexing and storing the visual images. As well, greater efficiencies should be evident in the viewing of highways and in property reviews. Indirectly, the projects extend and enhance the province's expertise base in geomatics and increases the potential for exporting services from New Brunswick.

4.5 Federal, Provincial and Private Sector Involvement

Assistance from DOC will consist of providing the time and services of CRC staff with experience in visual data bases.

Although the current focus of DOC's efforts in the field of visual data bases is on the retrieval of images that are not easily indexed, DOC has shown interest in working with New Brunswick departments to transfer their skills and knowledge.

For the most part, the projects will move forward through the efforts of the responsible agencies: Department of Transportation and the New Brunswick Geographic Information Corporation. The private sector will be indirectly involved through the sale of equipment and software and possibly through contracted-out services of recording and coding images. To obtain the most long-term economic benefit it is essential that private sector companies be used as much as possible for the provision of services. This will ensure that the expertise is resident in the private sector.

4.6 Sources of Funding/Programs

The projects should be funded from the regular budgets of the agencies. If there is any substantial amount of new technology to be developed, such as software or equipment to read and display images, this activity should be contracted to a company which could apply for assistance under IITD or other regional development programs.

4.7 Implementation Activities

Project leaders will need to be selected for both NBGIC and DOT. Together these two can map out the detailed plan for carrying out the projects. It would be advisable for both coordinators to work closely together, sharing information and possibly equipment. The key to successful completion is the selection of project leaders who are strong champions of the projects. The selection of these coordinators and the directing of their efforts will initially be performed with assistance from the Communications Advisory Team. Subsequently, the two coordinators will work jointly to further their projects.

Arrangements will need to be made with DOC and/or the Centre for Image and Sound for staff to be made available to the projects as needed. Jointly, the DOC, DOT and NBGIC will scope out the project and ascertain the requirements and costs. The Communications Advisory Team can act as the conduit to make the linkages.

5 Remote Data Collection/Sensor Platforms

5.1 The Need for Remote Data Collection/Sensor Platforms

Environmental issues are becoming increasingly important and prevalent. Monitoring of the environment is becoming a critical part of what the government does. Many of the environmental factors that must be monitored have sensors developed to perform the task. However, there appears to be a general lack of awareness about the type and function of sensors. The need in some cases is to increase awareness of what is available and to provide the resources to obtain the sensors.

The study identified a number of projects which require the collection and transmission of remotely sensed data. Two of these projects have the necessary components to see them advance and succeed:

- In Transportation, there is a desire to monitor weather and driving conditions at high-risk points on the province's highways in order to take actions to make these spots as safe as possible during adverse driving conditions

- In Natural Resources, there is a need to monitor weather conditions in areas at high risk of forest fire. These are sites which are not easily accessible, remote from any power lines or communications infrastructure. Early detection/prediction of forest fires can save large tracts of forest land and reduce the impact of forest fires.

5.2 Enabling Technology

There are two primary components to the technology: collection and transmission. Collection is not a communication technology in the strictest sense of the word; however, transmission is clearly a communication issue.

We are told that the sensing technology needed to collect and store the data is fairly readily available from different suppliers around the world. This technology has different levels of sophistication and cost.

The sensing technology for environmental factors is likewise very prevalent. The key is to develop a knowledge and information base and to determine the priorities to be addressed with what will surely be limited resources.

Transmission technology offers solutions which may be of several types, including telephone, radio, cellular, and satellite. Each of these technologies has its own strengths and weaknesses: telephone does not provide the required access to remote locations; radio does not have the necessary range without establishing relay towers; cellular presently has a limited (although growing) network, while all the infrastructure for a satellite based solution is not in place.

5.3 Projects Needed

The Department of Transportation (DOT) is the department responsible for the platform for road conditions. The device, once complete, will be used to monitor road conditions at critical and sometimes remote locations to allow for more efficient dispatching of crews for sanding, salting and ploughing.

The Department of Natural Resources (DNR) is the department responsible for the forest fire prediction and detection platform. The platform is in fact a remotely located weather station which will allow for the monitoring of conditions at locations around the province.

5.4 Economic Development Impact

There are good potential economic benefits to the province in the form of spinoff opportunities for a company manufacturing the technology needed to interface the sensor equipment with the communication medium. DOC has already worked with a company in British Columbia to transfer a similar technology, on the satellite side. However, there does appear to be an opportunity to develop a cellular interface, if this can be proven to meet the users' needs. A provincial company such as NCA Microelectronics of Saint John could be interested in developing and manufacturing such a communication link if it can be shown that there are other market opportunities for the technology outside the province.

5.5 Federal, Provincial and Private Sector Involvement

Both DOT and DNR are progressing with trials: DOT is planning a summer or fall trial implementation based on a land line connection; DNR is planning a summer trial with radio transmission to a base station and then verbal phone relay of the data. Once the concepts have proven themselves feasible; more research and trials will be necessary. For this phase both groups see the need for remote communication. It is at this phase that DOC involvement will be needed to advise on the addition of a communication link to the sensors. DOC can also assist in identifying potential suppliers and any particular technology solutions which may be available for licensing and arranging for MSAT data trials if it is decided that the satellite option offers the best solution.

Private sector involvement will only come once the projects have been discussed with DOC and a communications strategy is decided. If there is a need for any customized interfaces, then there may be a possibility for a company such as NCA to become involved.

5.6 Sources of Funding/Programs

Funding for these projects will arise primarily out of the budgets for the two departments. Funding for the research related to the development of a communications link may be available through ACOA or IRAP.

5.7 Implementation Activities

The two projects are moving ahead at what appears to be a good rate. The main requirement at this time is for CRC staff to meet with the project coordinators to see what DOC could do and to develop a work plan for bringing the projects to completion.

Environmental sensing issues will require an awareness creation effort to inform staff of available sensor technology. As well, a knowledge base needs to be developed to provide a reference source. The Communications Advisory Team can act as a liaison in conjunction with DOC to source the required information.

6 Mobile Data Service Trial for the Department of Transportation

This project involves the collection of vehicle related data (hours of operation, kilometres logged) on a faster and more timely basis.

6.1 The Need for an MDS Trial for the Department of Transportation

The Department of Transportation (DOT) finds it difficult to keep up-to-date records of utilization of its vehicles and heavy equipment. Manual recording is the current approach used, but users are not always as conscientious as they could be about their record-keeping. DOT would like a system to automatically record and transmit daily vehicle use records to a central location.

6.2 Enabling Technologies

The technology necessary for this project appears to be available via the mobile satellite project (MSAT) and Cal Gandalph terminals which will be supplied to DOC for MSAT trials. These terminals have been designed to allow for the transfer of data from vehicles to a central dispatch. An on-screen display allows the vehicle operator to respond to question prompts after which the data is transmitted via satellite to a central dispatch.

6.3 Projects Needed

The vehicle monitoring project appears to be ideally suited to an MSAT Mobile Data Service (MDS) trial. MDS would provide the means for the timely transmission of vehicular data (usage - distance and time).

6.4 Federal, Provincial and Private Sector Involvement

The first step is for DOT to contact the DOC MSAT trials branch for help in structuring this project.

There is no involvement of the private sector at the trials stage. For widespread use of the technology the private sector will be a supplier; however, this stage will only arise if an when the application is deemed successful.

6.5 Sources of Funding/Programs

The trials programs are offered by DOC which has purchased a stock of the Cal Gandalph terminals and has leased time on the Inmarsat satellite. As such all support for the trial is coming from DOC.

6.6 Implementation Activities

The implementation of this project will rely on the initiative of the DOT. At this stage what is required is that a formal trial application be submitted to DOC. Assistance in structuring the application can be obtained either through the district office in Saint John or the regional office in Moncton. Once accepted the two organizations will work together to finalize the arrangements.

7 Conclusions

7.1 Opportunities

The preceding four chapters have presented the most promising opportunities for technology transfer. These chapters have been presented in order of the magnitude of the potential opportunity. Exhibit 1 is a summary of the opportunities, the degree of need, the technologies involved and the economic impact of each.

The Personal Communications Application Centre represents the most significant opportunity from all perspectives. The need is high and it presents the opportunity to significantly enhance the level and efficiency of services provided by the provincial government. The economic development impact is likewise very significant. In fact, proponents view ISDN as an opportunity to accelerate New Brunswick ahead of other regions, not only now but on a continuing basis.

Videologs represents a good opportunity for the development of a small scale service industry. However, the more significant impact may arise from the inclusion with Landnet and the resultant enhancement to the province's GIS/Geomatics industry.

The opportunities related to the remote data collection and transmission project arise from the improvement in services and reduction in losses of forest land due to forest fires. The fact that these projects can help a New Brunswick company develop a saleable product would be an additional benefit.

The MDS trial represents a one-off opportunity that can improve the efficiency of the Department of Transportation.

Exhibit 1 - Summary of Opportunities

	Personal Communications Application Centre	Videotex	Remote Collection Platforms	MDN Trial
NEED	**HIGH**	**MODERATE**	**HIGH**	**LOW**
Primary	ISDN	Videodisks	MSAT	MSAT
Enabling Technology	Visual Data Base	CDROM	Cellular	Cal Gandalph Terminal
Primary involvement				
Federal	Commitment to utilization	Technical assistance	Technical assistance	Trial, access to Cal Gandalph Terminal and Inmarsat
	Technical Assistance		R&D Funding	
Provincial	Commitment to utilization	Projects Funding	Projects Coordination	Project and Coordination
	Application assistance		Funding	
Private Sector	NB Tel - ISDN Network investment and utilization other private sector application development	Channel for commercialization	R & D	Nil
			Expertise	
			Channel for commercialization	
Economic Development Impact				
	Industry Creation	Service Industry Development	Service industry related to locating and packaging	Nil
	Technology Lead	GIS Enhancement	Manufacturing related to communications link	
	Service/Information Industry	Landnet enhancement		
	Test Bed			
	Applications Development			

8 Recommendations

This section presents our recommendations for a way to manage the issues related to communications technology, to further advance the specific projects that were identified, and to maximize the economic benefits.

Recommendation # 1 - Establish a Permanent Communications Advisory Team

The role of the communications advisory team will be: to implement the recommendations of this study; to act as a clearing house for ideas and information related communications; to act as a liaison between the user and the provider (either DOC or private sector), and to promote economic development opportunities by contracting out, to provide supportive lobbying within departments for communication needs.

This advisory team will initially consist of the members of this study's steering committee. These members should be replaced by "users". This will consist of communications project leaders and representatives of interested departments. The involvement of DOC's regional office will need to be kept throughout this process as this group will be essential to the liaison function. Especially critical to the success of this advisory team is the selection of a proactive chairperson.

Recommendation # 2 - Select a Proactive Chairperson

This chairperson will play a catalytic role in the advancement of communications technology. The person selected should have a good grasp on the technology and the potential applications. They should also be familiar with related provincial efforts such as geomatics. The chairperson should have a good rapport with government departments so as to allow a close working relationship.

In addition to directing the efforts of the Communications Advisory Team, the Chairperson must also frequently visit the DOC research labs. The purpose of these visits is to discover what projects are underway and to determine what, if any application they may have in New Brunswick. The Chairperson, in conjunction with the advisory team, must create awareness about projects and potential applications by broadcasting potential opportunities to provincial staff.

While it is the overall responsibility of the advisory team to promote economic development opportunities, it is also the specific responsibility of the chairperson to see that this occurs.

Recommendation # 3 - Push for Early Implementation of the ISDN Technology
This involves commencing discussions with NBTel to determine what is needed and how to make it work. Based on these discussions, the case for ISDN will be built. This will involve a detailed feasibility study and a conceptual design of form of involvement: personal communications lab; an application centre; or separate discreet projects.

Recommendation # 4 - Implement the Results of the Conceptual Design Study
This may involve locating staff, identifying sources of funding (perhaps the establishment of a subsidiary agreement), and putting into place the other components as outlined in the conceptual design.

Recommendation # 5 - Match Ideas and Needs with Opportunities to Create Projects
On an on-going basis the Communications Advisory Team should proactively work to make a match between ideas/needs and opportunities. It is essential for the continuing vitality of communications efforts that new, useful and viable projects are found and promoted. This will result in the on-going advancement of communications and technology in the province.

Recommendation # 6 - Involve the Private Sector in Projects to the Greatest Extent Possible

This private sector involvement will take the form of contracted services - such as videologging. It will also be in the development of solutions, feasibility assessment of ideas, conceptual designs and planning of approaches, and the commercialization of applications.

To maximize the economic benefit of the efforts that are undertaken, it is critical to have a high degree of private sector involvement. With this involvement evident the efforts of expanding communications technology can truly be a success.

Persons to be contacted related to specific projects:

1. Emphasis on Personal Communications

Federal	-	David Mulcaster - DOC
Provincial	-	To be determined
Private Sector	-	Peter Jollymore - NBTel

2. Image, Compression, Storage and Retrieval

Federal	-	Tom Whalen - DOC - Communications Research Centre
Provincial	-	NBGIC - Assessment Branch
	-	DOT - Carol Young
Private Sector	-	To be determined

3. Remote Data Collection/Sensor Platforms

Federal	-	Martin McLellan - DOC Moncton
	-	Allister Pedersen - DOC - Communications Research Centre
Provincial	-	DOT - Brian Leger
	-	DNR - Stephen Conn
Private Sector	-	NCA Microelectronics (Saint John)

4. Mobile Data Service Trial for the DOT

Federal	-	Guy in Saint John
	-	Allister Pederson
Provincial	-	Tony Richard
	-	John Palmer/Brian Leger - have arranged other MSAT Trial
Private Sector	-	To be determined

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